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THE MONIST

PSYCHIC AND ORGANIC LIFE.¹

WHEN we place a finger in the hand of a new-born child, he clutches it tightly; if we put a finger in his mouth, he immediately sucks it with might and main. Similar observations may be made of animals, and even—though not quite so easily—of plants; that is to say, various stimulations of the organism produce each a particular reaction, most of the reactions being directed, apparently, towards self-preservation.

If we examine the stimuli that affect our bodies, we notice that in addition to the reactions resulting immediately from stimuli and those intentionally modified by us there is something else which is not discernible objectively but only subjectively, and that is sensation. Our sensations are very rich and manifold. It is very probable that this is also true of creatures with organizations resembling ours; this assumption, however, becomes less and less valid the more the organization in question differs from our own. We can distinguish our sensations one from another, and can remember them.

The orderly, continuous coherence of sensations and memories makes up consciousness. But even our sensations are not always equally clear and distinct, and our sense of their connection with each other is not always equally strong. In sleep, in dreams, in fainting fits, memory and the sense of coherence fail us either partially or

¹ Translated by Margaret Ladd Franklin from the *Oesterreichische Rundschau*, XXIX, 1.

entirely. The farther back into our youth our thoughts penetrate, the less clear our memories become; at length we can discover only occasional islands of remembrance, and finally nothing at all.

We are forced to conclude that what may happen sometimes to us may happen also to other living creatures. Perhaps those that are least like us pass their lives in a kind of sleep or dream or semi-consciousness, so that their psychic life has scarcely any resemblance to our waking condition. For those organisms especially whose existence is maintained by automatic reactions to certain disturbing, injurious stimuli, a more fully developed psychic life is not necessary.²

Memory is the reawakening of a previous psychological state. A sufficient condition for this reawakening is the excitation of one element of the earlier state. We are therefore justified in asserting that every part of a given psychological state seeks completion by uniting itself with the whole to which it once belonged. This is the so-called law of association through simultaneity, upon which depends our ability to assign to each memory its proper place in the temporal series. If I see a dish, or a box, and also take hold of it and examine its contents, then the mere sight of it afterwards will remind me of its feeling to the touch, of its contents, and so forth. This may be useful to me in that it may save me the trouble of unnecessary further investigation; or it may deceive me, when, for instance, what I have seen is a mere optical image, which cannot be touched, or a picture, which affords me no further sensations, or very different ones from those I had expected. Cases in which memory is an aid to us we speak of as perceptions; cases in which it deceives us, as illusions. I experience a special kind of illusion when I watch the

² Cf. I. von Uexküll, *Umwelt und Innenwelt der Tiere*. Berlin, 1909, Springer.

lights and shadows cast upon old gnarled tree-trunks when the setting sun shines in among the leaves. The heads of bears, tigers, and men come into view, this light or that shadow having the effect of a snout, or a nose, or an ear. One has to guard against illusions such as these—half unconscious, half voluntary—when, at the end of a long and tiresome railway journey, one is looking at the rocks, trees and other objects by the side of the track. Thus it is that in our consciousness sensations unite with the memories they awaken to form many kinds of complexes, some useful, some disadvantageous.

When we compare memories with sensations, we find that the former appear to us dull, pale, imperfect, sketchy, fleeting, in comparison with the latter. But we must consider that sensation furnishes many details to the adequate seizing of which a considerable duration of the stimulus is necessary; on the other hand, the stimulation of memory takes place instantaneously. If we take the pains to observe the separate elements of the sensation, we can also keep them in mind—that is, recall them to memory. This is shown by the fact that particularly simple objects, which we get to know fairly accurately without any trouble, give rise to vivid memories. Think, for instance, of a big black A on a white surface, or of a regular star-pentagram, with one point vertically upward, drawn with green chalk on a black surface. Think of a cube presenting three surfaces to view, the upper horizontal surface yellow, the left-hand vertical surface blue, the right-hand vertical surface red. In such cases, for which one knows the rules, one will have no difficulty in obtaining a fresh, vivid memory. In cases where one has not observed the details of the impression, it is mere tautology to say that one cannot call up a vivid memory. An unpractised person would have a great deal of difficulty in remembering a Moorish ornament complicated in color and in form, such as those in Owen Jones's

Grammar of Ornament. The physicist has no difficulty in remembering exactly a spectrum, or an interference phenomenon, upon which he has been engaged; and a zoologist can draw an animal from memory. If one wishes to picture to oneself a garden arranged for a festival, it helps very much if one thinks of oneself as engaged in the work of preparing it, hanging up the decorations, the Chinese lanterns, etc.

One of my sons, who is a painter, will watch a street scene closely, but will not put it on canvas until he comes home. "In order to see what is typical in the figures," he says, "I must first imprint upon my mind by long-continued observation the regularly recurring characteristics of each figure. While I am in the street I pay attention chiefly to the details, to what is characteristic in the figures, whereas when I am at home I sketch patches rather than figures, in order to obtain the necessary relations of light and shade, and then read into these patches the corresponding figures. The after-image that I get when I close my eyes is often helpful. Figures in a skating scene are particularly easy to retain in this way, because they give a strong after-image. In copying pictures I think I have learned a great deal of technic. By dint of practice I find myself able to copy a painting from memory."

Memories are awakened by sensations, but it may also happen that one memory is aroused by another. The law of association for memories is none other than the above-mentioned law of simultaneity. Memories are awakened originally only through temporal contiguity. But since in the course of a lifetime our memories have come into temporal contiguity in a great multiplicity of ways, they have lost the strong and definite time reference. Memories without express time reference we call concepts. Concepts are the building-stones of the freer intellectual life. Now since concepts have their roots in very different sen-

sation realms, and since corresponding to those sensation realms there are different memories which were separately acquired and may be separately lost—the human memory consists in fact simply of a bundle of separate memories—the result of all this is that the mutual excitation of memories leads man along the ways of biological interest through the most remarkable labyrinthine paths.

Suppose, for instance, I am arranging an experiment in anomalous dispersion; the names of the originators of these studies — Christiansen and Kundt — come into my head. The former I met in London, the latter in Paris. Typical bits of these cities rise up before me. I see the scenes from the Paris electrical exhibit and from the congress of electricians held there in 1881; I see the first electric road, the great dynamo machines, the incandescent illumination, the Jablochkoff lights in the Avenue de l'Opéra; I hear the songs given out by the many Edison phonographs; I make the acquaintance of Wroblewski and am reminded of his sad death; I hear a lecture by Melsen—which suggests experiments with projectiles and brings me back again to my laboratory here in Prague. All this in a few seconds! Of all that my senses experienced in those three months, there are left to me only a few vivid little impressions on eye and ear. A few charming pictures of Paris streets still cling to me. I hear Helmholtz being consistently called "Monsieur Homhotz," while Emil Dubois-Reymond, on the other hand, pronounces German names with a strong French accent.

What is the cause of this poverty of sensations? It lies in the fact that while in Paris I lived more in my mind than in my senses. How do I know that I was in Paris at all? I took a ticket for Paris at the station in Prague, on the assumption that all men mean the same city when they say "Paris." I did not use my senses to find that city. What first-hand knowledge of geography is shown,

on the other hand, by a swallow returning from Africa! After escaping the kitchens of Italy, it finds again not only Vienna but even the old street, and in the street the house with its old nest. I ask for food and drink, for fork, knife, spoon, compasses, ruler, and yardstick on the assumption that others use these words in the same way that I do, and that others react towards these things in the same way that I do. Of course the things must be recognized by more or less definite sensation-marks, but it is not in the least necessary that I myself should thus recognize them. The sense-characteristics of an object may vary more or less without invalidating its name, and they belong to the domain of various different senses. A man's senses are relieved through the help he gets from other men, while his intellect carries a correspondingly heavier burden. The swallow, on the contrary, has to depend entirely on its senses.

G. T. Fechner, in the second volume of his *Psychophysik* (1860), and Francis Galton, in his *Inquiries into Human Faculty* (1883), give accounts of their investigations concerning the power of visualization. The results arrived at by those two investigators are in agreement. In many people—travelers, artists, children, simple men whose occupations require the use of the senses—the power of visualization is great. They can represent to themselves the objects with which they have been engaged, seeing them in all their details and in vivid colors. Those, on the other hand, who are much occupied with abstractions—scholars, for instance, and especially philosophers—have only pallid and indistinct visual images. This is the natural consequence of the habitual inactivity of their senses. I think that for my part I belong in the intermediate class; I have, indeed, kept my visualizing faculty in constant practice, but I readily admit that it has suffered some-

what after all through the attention I have given to abstract things.

The ability voluntarily to summon up clear and accurate memories of sense experiences must be distinguished from the faculty of retaining sense impressions involuntarily and having them reproduce themselves without intention on our part. I have only to busy myself for a while with the vibration curves described by tuning-forks in white on carbon paper, and these curves will flash before me now and then, especially at twilight time, with all the vividness of reality—and always without any exercise of my will. The forms that we observe in this fashion are so closely allied with the things themselves as we have actually seen them, and so different from visual after-images, that Fechner was right in designating them as phenomena of sense memory. When, as a child, I lay down to sleep and shut my eyes, my whole visual area was filled with the most beautiful changing wall-paper patterns—generally flower designs. Even now, when I am a little tired, and shut my eyes, especially on a very sunny afternoon, I at once see a kind of wall-paper pattern, usually greenish yellow on a violet ground. The colors of figure and background often change to their complementaries, as they do in the case of the well-known polarization-figures produced by calcspar when the nicol is turned through a right angle. A short time ago, I saw before me in one of these involuntary observations a yellow-green bough with oak-leaves and acorns, beautifully shaded and molded.

Just before one falls asleep, these apparitions assume a special shape. One sees various human and animal forms, moving slowly, changing their shapes and identities, now vividly colored and now pale, and gradually passing over into real dream pictures. Johannes Müller has called them "*phantastische Gesichterscheinungen*" which change of their own free will; Maury and other French investigators

call them "*hallucinations hypnagogiques*." They are often quite strange, with nothing about them that seems familiar. But apparently they are really only memory pictures retained mechanically, sometimes even against our will, and coming back to us perhaps out of a distant past.

When I have been torn hither and thither by my thoughts throughout a sleepless night, and then finally, being tired out, succeed in restricting my attention to the visual field, then the slowly changing phantoms appear, and sleep generally follows. Once very late at night, while this change was in progress, there appeared at my left a rich foliage, and at my right, reaching close to the bed, a solid wall of rock which hid everything else from view. This interested me so much, since it reminded me of a scotoma which has sometimes troubled me, and also of a well-known desert hallucination which has been described under the name of "*le ragle*," that I became wide awake and lost, for a time, all chance of sleep. The slow transformations that the visual phantasms undergo when the attention is concentrated entirely upon them, is due to the absence of associational leaps from one memory-region to another. Occasionally, especially in dark winter nights, my visual phantasms are very colorless: sometimes I see deep black on a black ground, often splendid iron gratings.

Towards the end of a deep, peaceful sleep I see particularly quiet and stable phantasms, and I continue to see them even after I wake up. I wake out of a sleep of this kind and lie still for some time, with my eyes shut. I see my familiar bed-spread with all its folds, and my hands resting upon it. If I open my eyes, I find that it is still quite dark, or else that the folds of the spread, and the position of the spread and of my hands, are quite different from what they were in the phantasms. On one such occasion I see, as I lie awake with eyes closed, an entirely unfamiliar spread, of mottled color—gray, black and white; and it seems to

have high ridges with strong lights and shades, like a little bare granite mountain range. When I open my eyes the phantasm disappears, and I see my usual bed-spread. Another time as I wake up I am looking at a great flower-bed filled with many-colored flowers, like the flower-beds I have often seen in elaborate gardens. The colored phantasms come to me now much more readily if there is a bright morning sun, whereas in my youth this condition was not necessary.

I see a green river slowly gliding between fair meadows. The river changes gradually into a blue-green lake. When I awake the morning sun is shining brightly into the room. The quietness of the morning phantasms seems to be connected with the suppression of all disturbing associations—a condition which we may recognize as we wake up, since we often have to think for a minute before we know, for instance, whether it is morning or evening.

If one dreams that he is wandering through endless halls and cannot find the way out; or that he is vainly searching the house for his hat, or the familiar city for his house, or his street; or that he cannot read a text twice, because the letters are always getting mixed up; or that the money in his purse adds up differently every time he counts it over;—if, in short, there is no logic whatever in one's dreams, this state of things seems largely due to the spontaneous transformation of the dream phantasms—a transformation which is quick or slow according to one's mood.

The associations that take place while one is awake are governed by the same principle as those that take place in dreams, except that more possibilities are generally open to them. A sensation, or even a mere memory, that comes upon us in a waking hour, generally gives rise by association to a series of ideas, which produce in us a particular reaction and determine us to follow a definite line of conduct. A series of images started in this way may, if one

is awake, be prevented by some chance disturbance from running its course; but in a dream this cannot happen. A nervous man who while awake has thrown away a lighted match and neglected to stamp it out, may dream the next night about fighting a conflagration.³

A dream experience may also make itself felt very obstinately in a waking hour. Some years ago I dreamed very vividly that a manuscript which I had given to a publisher a long time before had been completely forgotten. When I was awake it took me several hours to persuade myself that the thing was only a dream. Several years later this dream came back to me with all the old vividness. This time, however, I succeeded in tracing the illusion to its probable source in an actual experience. Towards the end of the sixties I had the manuscript of the *Analyse der Empfindungen* in large part finished, and was thinking of dedicating it to Fechner. In a talk I had with him he appeared to be displeased by certain differences between my views and his. I therefore gave up the idea of the dedication to Fechner, and for a long time thought no more about publishing the manuscript at all. Vestiges of my plans, however, may still have lodged in my dreams, and then affected me in the daytime like a menacing psychic disturbance. Thus do waking and dreaming form two interconnected and mutually illuminative parts of the psychic life. But waking and dreaming, and hypnosis, too, in its various forms, all reveal to us only detached parts of the psychic life.

If in the course of a sleepless night I have straightened out part of my next day's work, I am often unable, when sitting at my desk, to recall the thoughts I had in the night. Careful remembrance of my situation and surroundings at the time the thoughts first came to me, will sometimes bring them back to me even at my desk. I am

³ Cf. W. Robert, *Der Traum*. Hamburg, 1886.

forced to suppose that the existence of an associative relation between different conscious conditions must greatly strengthen one's command over one's own thoughts.

Whole epochs of the psychic life sometimes fall away from us, as is shown in a report made by Prof. A. Forel,⁴ in connection with his assistant Dr. Naef. A Mr. N. came, by way of Naples and Genoa, to Zürich, and lived there unconcernedly, without knowing who he really was or to what family he belonged, until he saw a newspaper notice saying that a man whose name was the same as that on his own passport had disappeared, and that his family was making a search for him. Although he could remember nothing whatever, still he now felt that he was psychically diseased, and consulted Professor Forel. By cautious and persevering psychic treatment he was gradually brought to remember a journey to Australia which he had undertaken on an official mission; his memory, which he had lost through an attack of fever, was restored to him; he was given back to his family, and released from his tragic plight.

Only recently people are beginning to observe the phenomena of memory in connection with other organic processes. Ewald Hering has recognized the traits common to organic processes with and without the presence of consciousness, and has described them in his essay on Memory.⁵ R. Semon⁶ is investigating this relation more thoroughly; and he has adopted a terminology which takes nothing for granted in the way of biological theory.

Many biological processes give the impression that they are based on a mechanical repetition of a lesson that has been learned by heart. P. Huber tells of a certain cater-

⁴ Forel, *Der Hypnotismus*, fifth edition, pp. 215-233.

⁵ Hering, *Ueber das Gedächtnis als eine allgemeine Funktion der organisierten Materie*, 1870. English translation, *On Memory*, third edition, Chicago, Open Court Publishing Co., 1902.

⁶ Semon, *Die Mneme*, 1904; *Die mnemischen Empfindungen*, 1909.

pillar which produces for its metamorphosis a very complicated web. If he took the caterpillar out of a web that had been constructed as far as the sixth stage, and put it into one that had only reached the third stage, then the caterpillar would complete the fourth, fifth and sixth stages. But if it was put into a web that was further advanced than the one it had been removed from, it would begin the work just where it had left off in its last web, not realizing that its labor was superfluous. The robber wasp (*sphex*) digs a hole and then flies out for its prey, which it paralyzes by stinging it in certain definite parts of its body, to serve as food for its progeny. But before taking the quarry into the hole, the wasp creeps in to reconnoiter. Fabre sometimes removed the quarry a little way. The wasp then dragged it close up again, and again crept into the hole which it had just investigated. Fabre was able to repeat this experiment forty times in succession with the same result, whereupon he took the quarry away altogether. The wasp then stupidly closed up the entirely empty hole. Accordingly, it acts, not with reflection, but just as an unmusical player on the piano, who has mechanically learned a piece by heart, must always begin over again from the very beginning if he is interrupted.

Many insects live in the water while they are larvae, but not when they are fully formed. However, they go back to the water to lay their eggs. It seems probable that the physiologico-chemical process of forming eggs in their bodies reminds them of their own embryonic stage and their liking in that condition for the water.

Traits analogous to memory seem to be often evinced in the organic world. The law of association, or completion through temporal contiguity, holds good not only for the fully conscious psychic life, in which it was first observed, but also for dreams, and even for unconscious psychic processes. Is the law of association, however, the

only one that can give us light on the matter? If one wants fully to understand the psychic life through the law of association, one must accept the hypothesis of congenital associations in addition to the associations acquired during the life of the individual. The physiological correlate of the former kind of association would then be reflex action. It appears that we must not merely regard the separate processes of the organism as capable of being excited one by another, but that each partial process must also be assumed to have an independent life of its own. In this way only can we obtain a correct conception of a living organism.

I have shown above how a very exact memory may be called up by means of association. But any one who has experienced the spontaneous appearance of a phantasm, an hallucination characterized by complete sensuous objectivity, will hardly believe that this phenomenon is identical with the former one. In the former case we have the careful completion of a memory through conceptual steps; in the latter we are more often compelled to think, as does Johannes Müller for example, of a peculiar kind of independent existence. It has been found from psychiatric observations that the destruction of both eyes does not incapacitate one for having optical hallucinations, whereas the destruction of a certain portion of the cortex does have this result, and also deprives one of optical memory images.⁷

I have mentioned a scotoma from which I suffered. It began soon after an employee of the laboratory had to be dismissed because of his conduct. It was a flicker-scotoma, of the kind which look like drawings of fortifications. It started in the middle of the visual field, spread itself out over the whole area, and disappeared at the edge. Kant,

⁷ See, for example, Forel's *Der Hypnotismus*, Stuttgart, 1907; fifth edition, p. 33.

in one of his minor works, written when he was growing old, has described a similar eye disease. A distinguished oculist was unable to give me any information about this phenomenon, but the psychiatrist Dr. Arnold Pick immediately recognized it as due to a temporary affection of the brain which French doctors have called *migraine ophthalmique*. My scotoma recurred from time to time without ascertainable cause, and on each occasion vanished after a few minutes, having no annoying after-effects. It was gray on gray, with an occasional suggestion of faint colors. Sometimes there appeared distorted checker-board patterns. On one occasion I saw a gray-ribbed umbrella with a small hole within which my sight was undisturbed. After an apoplectic attack the scotoma completely disappeared, and it was only many years afterwards that it again showed itself now and then. It will no doubt be admitted that in the scotoma there is manifested a peculiar kind of cortical phenomenon which differs in origin from ordinary sensation and which has no connection with the laws of association.

Johannes Müller has already emphasized the part played by fatigue, hunger and thirst in the production of phantasms, and has thus also given us a better understanding of the hallucinations in which one imagines one is wandering through a desert. The desert hallucinations, which are described by d'Escayrac de Lauture, and later by P. Max Simon in his book *Le monde des rêves*,⁸ are common hallucinations, which one may have anywhere, even in bed. Ingenious physiological explanations, based on the structure of the retina and on stereoscopy, are entirely superfluous. Where the Arab sees palms, minarets, and camels, the European traveler sees fir-trees, clock-towers, horses, wagons, and so forth. Marco Polo long ago, in describing the desert of Lob (Gobi; in Chinese

⁸ Paris, 1888; second edition, pp. 296-305.

Scha-mo, "sand-sea") spoke of the wicked deceiving spirits that lived therein (hallucinations), who led travelers astray by their voices and caused them to lose their companions. Even in the Bible the desert is full of uncanny things. Isaiah, speaking of the destruction of Babylon, says (xiii. 21):⁹ "But wild beasts of the desert shall lie there; and their houses shall be full of doleful creatures and owls shall dwell there, and satyrs shall dance there."

ERNST MACH.

VIENNA, AUSTRIA.

⁹ Professor Mach says in comment on this passage that the translation is probably unreliable. The German version translates "ostriches" where our Authorized English Bible has "owls." Friends of Professor Mach explain that the translation "ostrich" is a conventional term for a nondescript bird, that the word "satyr" means in Hebrew shaggy creatures like goats. The Polychrome Bible translates the passage thus:

"Wild cats will lie down there, ...

Their houses will be full of jackals, ...

Ostriches will dwell there, satyrs will dance there."